ATMOSPHERE/ENERGY UNDERGRADUATE MAJOR

COVID-19-Related Degree Requirement Changes
For information on how Atmosphere/Energy (A/E) degree requirements have been affected by the pandemic, see the 'COVID-19 Policies tab (http://explorerdegrees.stanford.edu/schoolofengineering/civilandenvironmentalengineering/#covid19policies/text)' in the 'Civil and Environmental Engineering' of this bulletin. For University-wide policy changes related to the pandemic, see the 'COVID-19 and Academic Continuity (http://explorerdegrees.stanford.edu/covid-19-policy-changes/)' section of this bulletin.

Atmosphere/Energy (A/E)
Completion of the undergraduate program in Atmosphere/Energy leads to the conferral of the Bachelor of Science in Engineering. The subplan 'Atmosphere/Energy' appears on the transcript and on the diploma.

Mission of the Undergraduate Program in Atmosphere/Energy
Atmosphere and energy are strongly linked: fossil-fuel energy use contributes to air pollution, global warming, and weather modification; and changes in the atmosphere feed back to renewable energy resources, including wind, solar, hydroelectric, and wave resources. The mission of the undergraduate program in Atmosphere/Energy (A/E) is to provide students with the fundamental background necessary to understand large- and local-scale climate, air pollution, energy problems and solve them through clean, renewable, and efficient energy systems. To accomplish this goal, students learn in detail the causes and proposed solutions to the problems, and learn to evaluate whether the proposed solutions are truly beneficial. A/E students take courses in renewable energy resources, indoor and outdoor air pollution, energy efficient buildings, climate change, renewable energy and clean-vehicle technologies, weather and storm systems, energy technologies in developing countries, electric grids, and air quality management. The curriculum is flexible. Depending upon their area of interest, students may take in-depth courses in energy or atmosphere and focus either on science, technology, or policy. The major is designed to provide students with excellent preparation for careers in industry, government, and research; and for study in graduate school.

Requirements
Mathematics and Science (45 units minimum):

Mathematics  
23 units minimum, including at least one course from each group:

Group A  
MATH 53  Ordinary Differential Equations with Linear Algebra  
CME 102  Ordinary Differential Equations for Engineers  

Group B  
CME 106  Introduction to Probability and Statistics for Engineers  
STATS 60  Introduction to Statistical Methods: Precalculus  
STATS 101  Data Science 101  
STATS 110  Statistical Methods in Engineering and the Physical Sciences

Science  
20 units minimum, including all of the following:

PHYSICS 41  Mechanics  
PHYSICS 43  Electricity and Magnetism  
or PHYSICS 45  Light and Heat  
CHEM 31B  Chemical Principles II  
or CHEM 31M  Chemical Principles: From Molecules to Solids  
CEE 70  Environmental Science and Technology  

Technology in Society (1 course) 3-5  
One 3-5 unit course required; must be on School of Engineering Approved List the year taken.

Writing in the Major (WIM)  
One 3-5 unit course required. Choose a TiS course that fulfills a WIM:

BIOE 131  Ethics in Bioengineering  
COMM 120W  The Rise of Digital Culture  
OR one of these WIM courses (do not fulfill TiS):

CE 100  Managing Sustainable Building Projects  
ENGR/CEE 102W  Technical and Professional Communication  
EARTHSYS 200  Environmental Communication in Action: The SAGE Project

Fundamentals and Depth: At least 40 units total must be from the School of Engineering

Engineering Fundamentals  
Two courses minimum (recommend 3), including at least one of the following: 7-9

ENGR 50E  Introduction to Materials Science, Energy Emphasis (ENGR 25E also accepted (no longer offered))

Plus at least one of the following:  
ENGR 10  Introduction to Engineering Analysis  
CSE 106A  Programming Methodology

A third Fundamental is optional but recommended (3-4 units)

Engineering Depth  
Required: 6-8 units, Introductory seminars may not count toward  
32 units from the following with at least four courses from each group; at least 40 of the units in ENGR Fundamentals and Depth must be from the School of Engineering:

Group A: Atmosphere  
AA 100  Introduction to Aeronautics and Astronautics  
CE 63  Weather and Storms  
CE 101B  Mechanics of Fluids  
or ME 70  Introductory Fluids Engineering  
CE 161I  Atmosphere, Ocean, and Climate Dynamics: The Atmospheric Circulation  
CE 162I  Atmosphere, Ocean, and Climate Dynamics: the Ocean Circulation  
CE 172  Air Quality Management  
CE 178  Introduction to Human Exposure Analysis  
EARTHSYS 111  Biology and Global Change  
or EARTHSYS 142  Remote Sensing of Land  
or EARTHSYS 144  Fundamentals of Geographic Information Science (GIS)
The A/E honors program offers eligible students the opportunity to engage in guided original research, or project design, over the course of an academic year. Interested student must adhere to the following requirements:

1. Prospective honors students write up and submit a 1-2 page letter applying to the honors program in A/E describing the problem to be investigated. The letter must be signed by the student, the current primary adviser, and the proposed honors adviser, if different, and submitted to the student services office in the Department of Civil and Environmental Engineering (CEE). The application must include an unofficial Stanford transcript. Applications must be received in the fourth quarter prior to graduation. It is strongly suggested that prospective honors students meet with the proposed honors adviser well in advance of submitting an application.

2. Students must maintain a GPA of at least 3.5.

3. Students must complete an honors thesis or project over a period of three quarters. The typical length of the written report is 15-20 pages. The deadline for submission of the report is to be decided by the honors adviser, but should be no later than the end of the third week in May.

4. The report must be read and evaluated by the student’s honors adviser and one other reader. It is the student’s responsibility to find and obtain both the adviser and the reader. At least one of the two must be a member of the Academic Council in the School of Engineering.

5. Students must present the completed work in an appropriate forum, e.g. in the same session as honors theses are presented in the department of the adviser. All honors programs require some public presentation of the thesis or project.

6. Students may take up to 10 units of CEE 199H Undergraduate Honors Thesis (optional). However, students must take ENGR 202S Directed Writing Projects or its equivalent (required). Units for the writing class are beyond those required for the A/E major.

7. Two copies of the signed thesis must be provided to the CEE student services office no later than two weeks before the end of the student’s graduation quarter. A pdf of the thesis, including the signature page signed by both readers, should be submitted to the student services officer by May 15. Students will be sent email instructions on how to archive a permanent electronic copy in Terman Engineering library.

For additional information and sample programs, see the Handbook for Undergraduate Engineering Programs (UGHB) (http://ughb.stanford.edu).